

Seunghee Kim, Ph.D., P.E.

Associate Professor, Dept. of Civil & Environmental Engineering, Univ. of Nebraska-Lincoln
203G Peter Kiewit Institute, 1110 South 67th St, Omaha, NE 68182, USA
Contact: +1 (402) 554-3547 (office); seunghee.kim@unl.edu (email)
<http://engineering.unl.edu/civil/faculty/seunghee-kim/>
Google Scholar: <https://scholar.google.com/citations?user=yIbmHbsAAAAJ&hl=en>

I. RESEARCH AREAS

- Fundamental study: Multi-phase/reactive fluid transport in deformable porous media; Poro-mechanics; Mineral dissolution/precipitation; Hydro-chemo-thermo-mechanically coupled analysis.
- Applicational study – Energy geotechnics: CO₂ geologic storage & utilization; Geologic storage of spent nuclear fuels (SNF); Underground hydrogen storage (UHS); Geologic hydrogen production; Large- and small-scale compressed air energy storage (CAES); Gas hydrate-bearing sediments; Geothermal energy.
- Geotechnics for resilient bridge/transportation infrastructures: Soil-pile interactions; Geosynthetics-reinforced soils; Resilient bridge abutments and roadways; Real-time sensing and data analysis; Roadside barrier systems; biochar-amended soils.

II. EARNED DEGREES

Ph.D., Geosystems Engineering, School of Civil and Environmental Engineering Georgia Institute of Technology, Atlanta, Georgia, USA Minor: Physical and chemical properties of geo-materials	(Dec. 2012)
M.S., Geosystems Engineering, School of Civil and Environmental Engineering Georgia Institute of Technology, Atlanta, Georgia, USA	(May 2011)
M.S., Geotechnical Engineering, Department of Civil and Environmental Engineering Korea Advanced Institute of Science and Technology (KAIST), Daejeon, Korea	(Feb. 2005)
B.S., Department of Civil and Environmental Engineering, KAIST, Daejeon, Korea Minor: Management engineering	(Feb. 2003)

III. EMPLOYMENT

- Associate Professor, University of Nebraska-Lincoln, Lincoln, Nebraska (August 2023~Present)
- Assistant Professor, University of Nebraska-Lincoln, Lincoln, Nebraska (Aug. 2016~July 2023)
- Assistant Professor, Western New England University, Springfield, Massachusetts (Aug. 2014~Aug. 2016)
- Postdoctoral Fellow, Bureau of Economic Geology, The University of Texas at Austin, Austin, Texas (Mar. 2013~Aug. 2014)
- Instructor, Georgia Institute of Technology, Atlanta, Georgia (Aug. 2012~Dec. 2012)
- Researcher, Korea Institute of Civil Engineering and Building Technology (KICT), Gyeonggi, Korea (Feb. 2007~June 2008)
- Assistant Manager, Dongho Co., Ltd., Gyeonggi, Korea (Jan. 2005~Jan. 2007)

IV. PUBLICATIONS

Journal Papers (h-index: 16, i10-index: 21 - as of November 15, 2023)

Published

42. Yosef, T.Y., Faller, R.K., Fang, C., and **Kim, S.** (2023). "Modeling dynamics of laterally impacted piles in gravel using erosion method." *Geotechnics*, 3(4), 1251-1278. DOI: 10.3390/geotechnics3040068.

41. Feng, Y., Eun, J., **Kim, S.**, and Kim, Y.-R. (2024). "Evaluation of equivalent thermal conductivity for carbon fiber-reinforced bentonite through experimental and numerical analysis." *Computers and Geotechnics*, 165, 105880. DOI: 10.1016/j.compgeo.2023.105880.
40. Grasley, J., Azzam, A., Rahmani, M., Kim, Y.-R., Eun, J., and **Kim, S.** (2024). "Evaluation of desiccation behavior in basalt microfiber-reinforced bentonite clay for geological repositories of nuclear spent fuel using digital image correlation." *Journal of Testing and Evaluation*, 52(1). DOI: 10.1520/JTE20230299.
39. **Kim, S.**, Zhang, J., and Ryu, S. (2023). "Experimental Study: the effect of pore shape, geometrical heterogeneity, and flow rate on the repetitive two-phase fluid transport in microfluidic porous media." *Special Issue - Interfaces in Microfluidics, Micromachines*, 14, 1441. DOI: 10.3390/mi14071441.
38. Hosseini Zadeh, A., Kim, I., and **Kim, S.** (2023). "Characteristics of CO₂ hydrate formation and dissociation at different CO₂-water ratios in a porous medium." *International Journal of Greenhouse Gas Control*, 125, 103883. DOI: 10.1016/j.ijggc.2023.103883.
37. **Kim, S.**, Dusseault, M., Babarinde, O., and Wickens, J. (2023). "Compressed air energy storage (CAES): Current status, geomechanical aspects, and future opportunities." *Geological Society, London, Special Publications* 528, no. 1 (2022): SP528-2022. DOI: 10.1144/SP528-2022-54.
36. Alhowaidi, Y., Eun, J., **Kim, S.**, Song, C.R., and Jaber, F. (2023). "Field monitoring and analysis of abutment foundation behavior for a curved integral abutment bridge under thermal loading." *Transportation Research Record*, 1-12. DOI: 10.1177/03611981231159873.
35. Hosseini Zadeh, A., Jeon, M.-K., Kwon, T.-H., and **Kim, S.** (2023). "Pore-scale experimental study on fluid injection into two-dimensional deformable porous media." *International Journal of Multiphase Flow*, 160, 104376. DOI: 10.1016/j.ijmultiphaseflow.2022.104376.
34. Ko, J., **Kim, S.**, Kim, S., and Seo, H. (2023). "Performance of a compressed-air energy storage (CAES) pile under various operation conditions." *Journal of Energy Storage*, 57, 106194. DOI: 10.1016/j.est.2022.106194.
33. Yosef, T.Y., Fang, C., Faller, R.K., and **Kim, S.** (2023). "A multi-material ALE model for investigating impact dynamics of pile-soil systems." *Soil Dynamics and Earthquake Engineering*, 164, 107648. DOI: 10.1016/j.soildyn.2022.107648.
32. Bekele, B. M., Song, C., Eun, J., and **Kim, S.** (2022). "Exploratory seepage detection in a laboratory-scale earthen dam based on distributed temperature sensing method." *Geotechnical and Geological Engineering*, DOI: 10.1007/s10706-022-02315-2.
31. Schultz, R.A., Heinemann, N., Horváth, B., Wickens, J., Miocic, J.M., Babarinde, O., Cao, W., Capuano, P., Dewers, T.A., Dusseault, M., Edlmann, K., Goswick, R.A., Hassanpouryouzband, A., Husain, T., Jin, W., Meng, J., **Kim, S.**, Molaei, F., Odunlami, O., Prasad, U., Lei, Q., Schwartz, B.A., Segura, J.M., Soroush, H., Voegeli, S., Williams-Stroud, S., Yu, H., and Zhao, Q. (2022). "An overview of underground energy-related product storage and sequestration." *Geological Society, London, Special Publications* 528, no. 1 (2022): SP528-2022. DOI: 10.1144/SP528-2022-160.
30. Babarinde, O., Schwartz, B., Meng, J., **Kim, S.**, Segura, J., Schultz, R.A., and Soroush, H. (2022). "An overview of geological carbon sequestration and its geomechanical aspects." *Geological Society, London, Special Publications* 528, no. 1 (2022): SP528-2022. DOI: 10.1144/SP528-2022-51.

29. **Kim, S.**, Hosseini Zadeh, A., Nole, M., Daigle, H., Huh, C., and Kim, I. (2022). "Spontaneous generation of stable CO₂ emulsions via the dissociation of nanoparticle-aided CO₂ hydrate." *Journal of Petroleum Science and Engineering*, 208, 109203. DOI: 10.1016/j.petrol.2021.109203.
28. Zhang, J., Zhang, H., Lee, D., Ryu, S., and **Kim, S.** (2021). "Study on the effect of pore-scale heterogeneity and flow rate during repetitive two-phase fluid flow in microfluidic porous media." *Petroleum Geoscience*, 27, petgeo2020-062. DOI: 10.1144/petgeo2020-062.
27. Zhang, J., Hosseini Zadeh, A., and **Kim, S.** (2021). "Geomechanical and energy analysis on the small- and medium-scale CAES in salt domes." *Energy*, 221, 119861. DOI: 10.1016/j.energy.2021.119861.
26. Kim, S., **Kim, S.**, Zhang, J., Druszkowski, E., and Sweidan, A. (2021). "Experiment and numerical studies on thermally-induced slip ratcheting on a slope." *Infrastructures*, 6, 5. DOI: 10.3390/infrastructures6010005.
25. Hosseini Zadeh, A., Mamirov, M., **Kim, S.**, and Hu, J. (2021). "CO₂-treatment of recycled concrete aggregates for improving mechanical and environmental properties." *Construction and Building Materials*, 275, 122180. DOI: 10.1016/j.conbuildmat.2020.122180.
24. Hosseini Zadeh, A., Kim, I., and **Kim, S.** (2021). "Characteristics of formation and dissociation of CO₂ hydrates at different CO₂-water ratios in a bulk condition." *Journal of Petroleum Science and Engineering*, 196, 108027. DOI: 10.1016/j.petrol.2020.108027.
23. Jeon, M.-K., **Kim, S.**, Hosseini Zadeh, A., and Kwon, T.-H. (2020). "Study on the viscous fluid flow in disordered-deformable porous media using hydro-mechanically coupled pore-network modeling." *Transport in Porous Media*, 133(2), 207-227. DOI: 10.1007/s11242-020-01419-8.
22. Pulatsu, B., **Kim, S.**, Erdogmus, E., and Lourenço, P.B. (2020). "Advanced numerical analysis of masonry retaining walls using mixed discrete-continuum approach." *Proceedings of the Institution of Civil Engineers - Geotechnical Engineering (ICE)*, 173(1). DOI: 10.1680/jgeen.19.00225.
21. Ko, J., **Kim, S.**, Kim, S., and Seo, H. (2020). "Utilizing building foundations as micro-scale compressed air energy vessel: Numerical study for mechanical feasibility." *Journal of Energy Storage*, 28, 101225. DOI: 10.1016/j.est.2020.101225.
20. Zhang, J., Zhang, H., Lee, D., Ryu, S., and **Kim, S.** (2020). "Microfluidic study on the two-phase fluid flow in porous media during repetitive drainage-imbibition cycles and implications to the CAES operation." *Transport in Porous Media*, 131(2), 449-472. DOI: 10.1007/s11242-019-01353-4.
19. Kim, I., Caroline, B., and **Kim, S.** (2020). "Feasibility study: Electromagnetic heating of soils using magnetic nanoparticle-coated geotextiles." *Géotechnique Letters*, 10(2), DOI: 10.1680/jgele.19.00098.
18. Park, Y.-C., **Kim, S.**, Lee, J. H., and Shinn, Y. J. (2019). "Effect of reducing irreducible water saturation in a near-well region on CO₂ injectivity and storage capacity." *International Journal of Greenhouse Gas Control*, 86, 134-145. DOI: 10.1016/j.ijggc.2019.04.014.
17. Bachus, R.C., Terzariol, M., Pasten, C., Chong, S.H., Dai, S., Cha, M.S., **Kim, S.**, Jang, J., Papadopoulos, E., Roshankhah, S., Lei, L., Garcia, A., Park, J., Sivaram, A., Santamarina, F., Ren, X. and Santamarina, J.C. (2019). "Characterization and engineering properties of dry and ponded class-F fly ash." *Journal of Geotechnical and Geoenvironmental Engineering*, 145(3), 04019003. DOI: 10.1061/(asce)gt.1943-5606.0001986.

16. Park, T., Joo, H.-W., Kim, G.-Y., **Kim, S.**, Yoon, S., and Kwon, T.-H. (2017). "Biosurfactant as an enhancer of geologic carbon storage: Microbial modification of interfacial tension and contact angle in carbon dioxide/water/quartz systems." *Frontiers in Microbiology*, 8:1285, DOI: 10.3389/fmicb.2017.01285.
15. **Kim, S.** and Hosseini, S.A. (2016). "Study on the ratio of stress-pore pressure changes during fluid injection and its implications for CO₂ geologic storage." *Journal of Petroleum Science and Engineering*, 149, 138-150. DOI: 10.1016/j.petrol.2016.10.037.
14. **Kim, S.** and Santamarina, J.C. (2016). "Geometry-coupled reactive fluid transport at the fracture scale: application to CO₂ geologic storage" *Geofluids*, 16, 329-341. DOI: 10.1111/gfl.12152.
13. **Kim, S.** and Hosseini, S.A. (2015). "Hydro-thermo-mechanical analysis during injection of cold fluid into a geologic formation." *International Journal of Rock Mechanics and Mining Sciences*, 77, 220-236. DOI: 10.1016/j.ijrmms.2015.04.010.
12. **Kim, S.** and Santamarina, J.C. (2015) "Reactive fluid flow in CO₂ storage reservoirs – Pore network model study." *Greenhouse Gases: Science and Technology*, 5, 462-473. DOI: 10.1002/ghg.1487.
11. **Kim, S.** and Hosseini, S. A. (2014) "Geological CO₂ storage: Incorporation of pore pressure/stress coupling and thermal effect to determine maximum sustainable pressure limit." *Energy Procedia*, 63, 3339-3346. DOI: 10.1016/j.egypro.2014.11.362.
10. Hosseini, S. A., **Kim, S.**, and Zeidouni, M. (2014) "Application of multi-well analytical models to maximize geological CO₂ storage in brine formations." *Energy Procedia*, 63, 3563-3567. DOI: 10.1016/j.egypro.2014.11.385.
9. **Kim, S.** and Santamarina, J. C. (2014). "CO₂ geological storage: Hydro-chemo-mechanical analyses and implications." *Greenhouse Gases: Science and Technology*, 4, 528-543. DOI: 10.1002/ghg.1421.
8. **Kim, S.** and Hosseini, S.A. (2014). "Above-zone pressure monitoring and geomechanical analyses for a field-scale CO₂ injection project, Cranfield, MS." *Greenhouse Gases: Science and Technology*, 4, 81-98. DOI: 10.1002/ghg.1388.
7. **Kim, S.** and Santamarina, J. C. (2014). "Engineered CO₂ injection: The use of surfactants for enhanced sweep efficiency." *International Journal of Greenhouse Gas Control*, 20, 324-332. DOI: 10.1016/j.ijggc.2013.11.018.
6. **Kim, S.** and Santamarina, J. C. (2013). "CO₂ breakthrough and leak - sealing experiments on shale and cement." *International Journal of Greenhouse Gas Control*, 19, 471-477. DOI: 10.1016/j.ijggc.2013.10.011.
5. Espinoza, D. N., **Kim, S.**, and Santamarina, J. C. (2011). "CO₂ geological storage – Geotechnical implications." *KSCE Journal of Civil Engineering*, 15(4), 707-719. DOI: 10.1007/s12205-011-0011-9.
4. Fragaszy, R. J., Santamarina, J. C., Amekudzi, A., Assimaki, D., Bachus, D., Burns, S. E., Cha, M. S., Cho, G. C., Cortes, D. D., Dai, S., Espinoza, D. N., Garrow, L., Huang, H., Jung, J. W., **Kim, S.**, Kurtis, K., Lee, C. H., Pasten, C. P., Phadnis, H., Rix, G. J., Shin, H. S., Torres, M. C., and Tsouris, C. (2011). "Sustainable development and energy geotechnology – Potential roles of geotechnical engineering." *KSCE Journal of Civil Engineering*, 15(4), 611-622. DOI: 10.1007/s12205-011-0102-7.
3. Lee, J.H., Koo, H.B., Kim, S.H., and **Kim, S.** (2011). "A case study of road upheaval caused by slope movement and verification of reinforcement using real-time monitoring." *The Journal of Engineering Geology*, 21(3), 221-230. DOI: 10.9720/kseg.2011.21.3.221.

2. Kim, S. H., Koo, H. B., and **Kim, S.** (2009). "A case study on the field investigation and stability analysis of the collapsed cut-slope in tunnel portal, Danyang." *The Journal of Engineering Geology*, 19(3), 401-408.

1. Koo, H. B., **Kim, S.**, Kim, S. H., and Lee, J. Y. (2008). "Study on jointed rock mass properties and analysis model of numerical simulation on collapsed slope." *Journal of Korean Geotechnical Society*, 24(5), 65-78.

Under Review

12. Yosef, T.Y., Faller, R.K., Fang, C., and **Kim, S.** "A State-of-the-art review on computational modeling of dynamic soil-structure interaction in crash test simulations." Under review.

11. Noh, D.-H., **Kim, S.**, Feng, Y., Calaunan, J.M.F., Eun, J., and Kim, Y.-R. "Geotechnical Engineering Perspective on Bentonite barriers for nuclear waste repository: Current Work, Key Engineering Properties, Opportunities, and Challenges." Under review.

10. Jeon, M.-K., **Kim, S.**, and Kwon, T.-H. "Flow-driven deformation in granular porous media: Dimensionless analysis." Under review.

9. Yosef, T.Y., Fang, C., Faller, R.K., **Kim, S.**, and Stolle, C. "Coupled FEM-ALE approach for simulating dynamic thin-walled structures-soil interaction under vehicular impacts." Under review.

8. Rahmani, M., Azzam, A., Grasley, J., Kim, Y.-R., Eun, J., and **Kim, S.** "Inverse characterization of shrinkage and fracture of bentonite buffer material for geological repositories of nuclear waste using an integrated DIC-FEM approach." Under review - Major revision.

7. Ismail, F., Mamirov, M., **Kim, S.**, and Hu, J. "Enhancing performance and reducing environmental impact of concrete with full replacement of recycled concrete aggregate (RCA) treated with various CO₂ pressures." Under review.

6. Orynbasarov, I., Barissov, T., **Kim, S.**, and Hu, J. "Engineering performance, economic, and carbon-footprint analysis of biochar-incorporated concrete with natural and recycled aggregate." Under review.

5. Bekele, B. M., Song, C., **Kim, S.**, and Eun, J. "Integrated laboratory-scale and numerical modeling of heat-seepage interaction in Earth dams." Under review – Minor revision.

4. Noh, D.-H., Hosseini Zadeh, A., Zhang, H., Wang, F., Ryu, S., Zhang, C., and **Kim, S.** "Convection-enhanced drug delivery: Experimental and analytical studies of infusion behavior in an in-vitro brain surrogate." Under review – Major revision.

3. Yosef, T.Y., Fang, C., Faller, R.K., **Kim, S.**, Bielenberg, R.W., Stolle, C.S., and Pajouh, M.A. "Development and evaluation of multi-material arbitrary Lagrangian - Eulerian method for modeling laterally impacted post-soil systems." Under review.

2. Yosef, T.Y., Fang, C., **Kim, S.**, Faller, R.K., Bielenberg, R.W., Stolle, C.S., and Pajouh, M.A. "Adaptive coupling of finite element method and smoothed particle hydrodynamics for simulating impact dynamics of post-soil systems." Under review - Major revision.

1. Feng, Y., Eun, J., **Kim, S.**, Dzenis, Y., and Kim, Y.-R. "Evaluation of desiccating characteristics of inorganic micro-fiber reinforced engineered barrier material (IMEBM) for geological repository." Under review.

Books, Book Chapters, and Other Publications

9. Tomac, I., Kim, S., and Makhnenko, R.Y. (2023). "Rock mechanics for GeoEnergy applications" *Geostrata*, February/March 2023 Engineering Geology & Rock Mechanics.

8. Hawkins, C., **Kim, S.**, Hu, J., Hosseini Zadeh, A., Mamirov, M., Ball, J., and Harper, N. (2021). "Final report: Improvement on the treatment of recycled concrete aggregates (RCA) using CO₂ for its commercial application (Phase-I)" Prepared by Hawkins Construction Company and University of Nebraska-Lincoln, Prepared for Nebraska Department of Economic Development. *This report is not available to the public until the protection of intellectual property gets approved and commercialization has proceeded.
7. Yosef, T.Y., Faller, R.K., and **Kim, S.** (2021). "Dynamic pile-soil interaction modeling advancements and enhancements to roadside safety applications" Report No. TRP-03-458-21, University of Nebraska-Lincoln and Midwest Roadside Safety Facility.
6. Schultz, R.A. and the USUTC Team (2021). "ARMA's Technical Committee on Underground Storage and Utilization", ARMA Letters, 32, 12–26.
5. **Kim, S.**, Eun, J., Alhowaidi, Y., and Robertson, D. (2021). "Feasibility study: Alternatives to prevent settlements and bumps at bridge approach" Report No. NDOT: SPR-P1(20) M106, University of Nebraska-Lincoln.
4. **Kim, S.** (2019). "Benchmark Portfolio: CIVE 334 - Introduction to Geotechnical Engineering," University of Nebraska-Lincoln, 26pg.
3. **Kim, S.**, Espinoza, D.N., Jung, J., Cha, M., and Santamarina, J.C. (2019). "Ch. 17: Carbon Geological Storage: Coupled Processes, Engineering and Monitoring" Science of Carbon Storage in Deep Saline Formations: Process Coupling Across Time and Spatial Scales, Edited by Newell, P. and Ilgen, A., Elsevier, pp. 287-304. DOI: <https://doi.org/10.1016/B978-0-12-812752-0.00017-4>.
2. Song, C. R., **Kim, S.**, Bekele, B., Zhang, J., and Silvey A. (2019). "CPT-Based Pile Design" Report No. NDOT: SPR-P1 M076/ NTC: 26-1121-4042-001, University of Nebraska-Lincoln.
1. Santamarina, J. C., Al-Ghoul, M., Alonso, E., Birkle, P., Calo, V. M., Cha, M., Fratta, D., Gale, J. F. W., Kaka, S. I., Kaszuba, J., **Kim, S.**, Lu, P., Mahmoud, M., McDougall, J., Patzek, T.W., Radke, C., Tarragona, A. R., Renard, F., Sanchez, M., Shin, H., Sultan, A. S., van Cappallen, P., van Dijk, C., Viggiani G., and Wuttke, I. F. (2016). "Dissolution and Precipitation: Implications for Energy Geo-Engineering" King Abdullah University of Science and Technology, 295pg.

Theses

2. Ph.D. Thesis (2012). "CO₂ geological storage: hydro-chemo-mechanically coupled phenomena and engineered injection." Georgia Institute of Technology, 188 pgs., Atlanta, Georgia.
1. M.Sc. Thesis (2005). "Subsurface Stiffness Imaging using HWAW (Harmonic Wavelet Analysis of Wave) method." Korea Advanced Institute of Science and Technology, 105 pgs., Daejeon, Korea.

Conference Papers

In English

40. Rahmani, M., Azzam, A., Grasley, J., Kim, Y.R., Eun, J., and **Kim, S.** (2023). "Computational-experimental approach for determining material parameters of bentonite clay in engineered barrier systems for nuclear waste repositories", 57th U.S. Rock Mechanics/Geomechanics Symposium, June 25-28, 2023, Atlanta, GA.

39. Feng, Y., Eun, J., **Kim, S.**, and Kim, Y.R. (2023). "Effect of relative humidity on water content and volume change in buffer blocks in geological repositories", 57th U.S. Rock Mechanics/Geomechanics Symposium, June 25-28, 2023, Atlanta, GA.
38. Noh, D.-H., **Kim, S.**, Eun, J., and Kim, Y.-R. (2023). "A new laboratory testing platform to study saturation swelling/contraction, desiccation cracking, and permeability of gas/liquid of engineered barrier materials at high-pressure-temperature conditions", 57th U.S. Rock Mechanics/Geomechanics Symposium, June 25-28, 2023, Atlanta, GA.
37. Hosseini Zadeh, A., Hawkins, C., Ball, J., Harper, N., Hu, J., and **Kim, S.** (2023). "Potential on carbon dioxide utilization to improve recycled concrete aggregates and reduce carbon footprint", Geo-Congress 2023, 64-74.
36. Alhowaidi, Y., **Kim, S.**, and Eun, J. (2023). "Field monitoring of soil response for curved integral abutment bridge during seasonal temperature changes", Geo-Congress 2023, 418-426.
35. White, J., Hu, Y., Ryu, S., **Kim, S.** and Zhang, H. (2022). "Geometric analysis of insect wing vein network", Fluids Engineering Division Summer Meeting, Vol. 85840, p. V002T06A002, American Society of Mechanical Engineers.
34. Calaunan, J.M.F., Eun, J., **Kim, S.**, and Kim, Y.-R. (2022). "Coupled effect of glass microfiber reinforcement and temperature elevation to the swelling and compressibility characteristics of bentonite", 56th U.S. Rock Mechanics/Geomechanics Symposium, June 26-29, 2022, Santa Fe, NM.
33. Grasley, J., Rahmani, M., Azzam, A., Nsengiyumva, G., Kim, Y.-R., Eun, J., and **Kim, S.** (2022). "Experimental investigation of desiccation behavior in inorganic microfiber-reinforced engineered barrier materials (IMEBM) for geological repository of nuclear spent fuel", 56th U.S. Rock Mechanics/Geomechanics Symposium, June 26-29, 2022, Santa Fe, NM.
32. Santamarina, J.C., Aftab, A., Espinoza, D.N., Dusseault, M., Gens, A., Hoteit, H., **Kim, S.**, Lee, J.-Y., Lei, L., Narsilio, G., Pereira, J.-M., Sanchez, M., Soga, K., Villar, M.V., Violay, M. (2022). "Energy geo-engineering" Proceedings of the 20th International Conference on Soil Mechanics and Geotechnical Engineering, Sydney.
31. Fleagle, S., Burberry, C., and **Kim, S.** (2022). "Regional characterization of stacked storage units for potential CO₂ sequestration in Western Nebraska, USA." EGU General Assembly 2022, Vienna, Austria, May 23-27, EGU22-375, <https://doi.org/10.5194/egusphere-egu22-375>.
30. Feng, Y., Eun, J., **Kim, S.**, and Kim, Y.R. (2021). "Comparison of desiccation cracks between bentonite and inorganic microfiber reinforced bentonite for engineered barrier system" Transactions of the American Nuclear Society, 124(1), 125-127.
29. Zhang, H., Johnson, A., Ryu, S., **Kim, S.**, and Zhang, C. (2021). "Fabrication of heterogeneous hydrogel models for convection-enhanced drug delivery studies" ASME 2021 International Mechanical Engineering Congress & Exposition, IMECE2021-67615.
28. Hosseini Zadeh, A., Kim, I., and **Kim, S.** "Experimental study on the characteristics of formation and dissociation of CO₂ hydrates in porous media" 2nd International Conference on Energy Geotechnics (ICEGT 2020), E3S Web of Conferences, 205, 02004, <https://doi.org/10.1051/e3sconf/202020502004>.
27. Zhang, J., Zhang, H., Lee, D., Ryu, S., and **Kim, S.** "Experimental study: Effect of pore geometry and structural heterogeneity on the repetitive two-phase fluid flow in porous media and its implications to PM-CAES" ICEGT 2020, E3S Web of Conferences, 205, 07010, <https://doi.org/10.1051/e3sconf/202020507010>.

26. Zhang, J., Seo, H., Kim, S., Ko, J., and **Kim, S.** "Experimental study of pipe-pile-based micro-scale compressed air energy storage (PPMS-CAES) for a building" ICEGT 2020, E3S Web of Conferences, 205, 07012, <https://doi.org/10.1051/e3sconf/202020507012>.
25. Jeon, M.-K., Hosseini Zadeh, A., **Kim, S.**, and Kwon, T.-H. "Fluid-driven mechanical responses of deformable porous media during two-phase flows: Hele-Shaw experiments and hydro-mechanically coupled pore network modeling" ICEGT 2020, E3S Web of Conferences, 205, 08009, <https://doi.org/10.1051/e3sconf/202020508009>.
24. Zhang, H., Palmon, T., **Kim, S.**, and Ryu, S. "Fabrication of a microchannel device with a three-dimensional pore network using a sacrificial sugar template" FEDSM 2020, July 12-16, 2020, Orlando, FL.
23. Zhang, J., Ko, J., Kim, S., Seo, H., and **Kim, S.** (2020). "Pipe-pile-based micro-scale compressed air energy storage (PPMS-CAES) for buildings: Experimental study and energy analysis" Geo-Congress 2020: Geo-Systems, Sustainability, Geoenvironmental Engineering, and Unsaturated Soil Mechanics (pp. 97-106), February 25-28, Minneapolis, MN.
22. Zhang, J., Zhang, H., Lee, D., Ryu, S., and **Kim, S.** "Experimental study on the two-phase fluid flow in porous media during repetitive drainage-imbibition cycles using microfluidics technique." Geotechnical Engineering in the XXI Century: Lessons learned and future challenges, Proceedings of the XVI Pan-American Conference on Soil Mechanics and Geotechnical Engineering (XVI PCSMGE), N.P. Lopez-Acosta et al. (Eds.), November 17-20, 2019, Cancun, Mexico, 2458-2465, doi: 10.3233/STAL190315.
21. Demuro, J., **Kim, S.**, and Zhu, C. "Influences of damage- and healing-induced microstructure changes on the permeability of 3D printed rock masses." 53rd U.S. Rock Mechanics / Geomechanics Symposium, June 23-26, 2019, Brooklyn, NY.
20. Hosseini Zadeh, A., Jeon, M.-K., Kwon, T.-K., and **Kim, S.** "Study of poroelastic deformation in soft elastic granular materials during repetitive fluid injection." 53rd U.S. Rock Mechanics/Geomechanics Symposium, June 23-26, 2019, Brooklyn, NY.
19. Kim, S., Druszkowski, E., Zhang, J., and **Kim, S.** "Numerical study on thermally-induced displacement ratcheting of a thin rock slab." Geo-Congress 2019: Geotechnical Materials, Modeling, and Testing, March 24-27, 2019, Philadelphia, PA, GSP 310, 506-513.
18. Kim, I., Best, C., and **Kim, S.** "Electromagnetic soil heating using magnetic nanoparticle-coated geotextiles." Geo-Congress 2019: Earth Retaining Structures and Geosynthetics, March 24-27, 2019, Philadelphia, PA, GSP 306, 376-382.
17. Prasun, S., **Kim, S.**, and Hosseini, S. A. "Geologic carbon storage: Implications of two-phase flow on injection-induced stress on faults." COMSOL Conference, October 3-5, 2018, Boston, MA, 14pg.
16. Kim, S., Fiedler, B. J., and **Kim, S.** "A landslide model with the shear band propagation: modification for unsaturated condition." International Foundations Congress and Equipment Expo, March 5-10, 2018, Orlando, FL, GSP 297, 314-323.
15. Ko, J., Seo, H., Kim, S., and **Kim, S.** "Numerical analysis: Mechanical behavior of pipe-pile used for micro-scale compressed air energy storage (CAES)." International Foundations Congress and Equipment Expo, March 5-10, 2018, Orlando, FL, GSP 294, 715-723.
14. **Kim, S.** and Hosseini, S. A. "Hydro-mechanical analysis during fluid injection into a geologic formation and implications for CO₂ geologic storage." 19th International Conference on Soil Mechanics and Geotechnical Engineering, Seoul, Korea, 2017, 3451-3454.

13. Kim, S., Ko, J., **Kim, S.**, Seo, H. and Tummalapudi, M. "Investigation of small-scale CAES (compressed air energy storage) pile as a foundation system." Geotechnical Frontiers 2017, 103-112.
12. **Kim, S.** and Santamarina, J. C. "Rock crushing using microwave pre-treatment." Geo-Chicago 2016: Sustainable Materials and Resource Conservation, 720-729.
11. Kim, S., **Kim S.**, Seo, H., and Jung, J. W. "Mechanical behavior of a pile used for small-scale compressed air energy storage." Geo-Chicago 2016: Geotechnics for Sustainable Energy, 135-143.
10. **Kim, S.** and Hosseini, S. A. "Effect of pore pressure/stress coupling on geological CO₂ storage." 13th Annual Carbon Capture, Utilization & Storage Conference, 2014, Pittsburgh.
9. Hosseini, S. A. and **Kim, S.** "Optimization of injection rates for geological CO₂ storage in brine formations." 13th Annual Carbon Capture, Utilization & Storage Conference, 2014, Pittsburgh.
8. **Kim, S.** and Santamarina, J. C. "Geological CO₂ storage: Reactive fluid transport - Pore-scale study -." Geo-Congress 2014, Atlanta.
7. **Kim, S.**, Hosseini, S. A., and Hovorka, S. D. "Numerical simulation: Field scale fluid injection to a porous layer in relevance to CO₂ geological storage." COMSOL Conference, Oct. 9-11, 2013, Boston.
6. Koo, H. B., **Kim, S.**, Kim, S. H., and Rhee, J. H. "A case study on safety analysis for uneven pressure at tunnel portal site." The 12th International Conference of IACMAG (International Association for Computer Methods and Advances in Geomechanics), Oct. 1-6, 2008, Goa, India.
5. Koo, H. B., Kim, S. H., **Kim, S.**, and Lee, J. Y. "A case study on the stability and numerical analysis of the collapsed cut-slope in Danyang, Korea." The 12th International Conference of IACMAG (International Association for Computer Methods and Advances in Geomechanics), Oct. 1-6, 2008, Goa, India.
4. **Kim, S.**, Kim, S. H., Rhee, J. H., and Koo, H. B. "Estimates of rock mass properties using the RMR and GSI system." Proceedings of the GSK (The Geological Society of Korea) 2007 Fall Conference 2007, Oct. 25-26, Chuncheon, Korea.
3. **Kim, S.**, Kim, D. S., Park, H. C., and Lee, J. S. "Subsurface Stiffness Imaging using Harmonic Wavelet Analysis of Waves (HWA) Method." Proceedings of 17th KKCNN Symposium on Civil Engineering, Dec. 13-15, 2004, Ayutthaya, Thailand, 531-537.
2. Kim, D. S., Bang, E. S., **Kim, S.**, and Park, H. C. "Subsurface stiffness imaging with SPT-uphole and HWA methods." Proceedings of Advanced in Structural Engineering and Mechanics (ASEM'04), Sept. 2-4, 2004, Seoul, Korea, 2070-2080.
1. Kim, D. S., **Kim, S.**, and Park, H. C. "Seismic site characterization using harmonic wavelet analysis of wave (HWA) method." Proceedings of US-Korea Joint Seminar/Workshop on Smart Structure Technologies, Sept. 2-3, 2004, Seoul, Korea, 335-346.

In Korean - Selected

6. Rhee, J. H., **Kim, S.**, Kim, S. H., and Koo, H. B. "A study on inventory of cut-slope using the mobile PC." KGS (Korean Geotechnical Society) Spring National Conference 2008, Mar. 28-29, 2008, Seoul, Korea, 813-820.
5. **Kim, S.**, Rhee, J. H., and Koo, H. B. "Numerical simulation and countermeasure on upheaval generation in the road caused by sliding of a slope." KGS Spring National Conference 2008, Mar. 28-29, 2008, Seoul, Korea, 833-841.

4. Kim, S. H., Koo, H. B., Lee, J. Y., Rhee, J. H., and **Kim, S.** "Geotechnical characteristics of the collapsed 00 tunnel slope in Yeosu-Suncheon area." KGS Spring National Conference 2008, Mar. 28-29, 2008, Seoul, Korea, 848-857.

3. Lee, J. Y., Koo, H. B., Kim, S. H., and **Kim, S.** "A stability evaluation according to inclination of upper natural slope in soil slope." 2008 Spring Conference, Korean Society of Hazard Mitigation, Feb. 28, 2008, Seoul, Korea, 577-580.

2. Kim, S. H., Koo, H. B., Rhee, J. H., and **Kim, S.** "Geotechnical characteristics of road cut slope in national highway 24 at Suknam pass, Eonyang-Milyang area." 2008 Spring Conference, Korean Society of Hazard Mitigation, Feb. 28, 2008, Seoul, Korea, 589-592.

1. Son, Y. J., Koo, H. B., Kim, S. H., and **Kim, S.** "Stability analysis and countermeasures on cut slopes within national road construction between Giseong and Wonnam." Proceedings of the KSEG 2007 Spring Conference 2007, Apr. 25-27, Gyeongju, 637-639.

V. RESEARCH GRANTS

- The total research grants awarded at University of Nebraska-Lincoln (UNL): \$10,534,044.
- Seunghee Kim's portion of the total research grants awarded at UNL: \$2,996,336.

V-1 Energy Geotechnics: CO₂ geologic storage & utilization; Geologic storage of spent nuclear fuels (SNF); Underground hydrogen storage (UHS); Natural hydrogen production; Large- and small-scale compressed air energy storage (CAES); Gas hydrate-bearing sediments; Geothermal energy systems.

#	Project Title	Sponsor	Period & Award	Investigators
10	Subsurface hydrogen migration and reactions for geological hydrogen production and engineered storage	Nebraska Center for Energy Sciences Research	Jan. 2024 – Dec. 2025. \$170,000	Seunghee Kim (PI), Karrie A. Weber (Co-PI), and Hyun-Seob Song (Co-PI)
9	Resource assessment for carbon dioxide storage via accelerated carbonation reaction with recycled concrete aggregates (RCA)	U.S. Department of Energy	July 2023 – June 2025. \$1,006,450	Seunghee Kim (PI), Jiong Hu (Co-PI), Eric Thompson (Co-PI), and Chris Exstrom (Co-PI, UNK)
8	Building partnership with Sandia National Laboratories to develop novel engineered barrier materials for geological nuclear waste repository	U.S. Department of Energy	Oct. 2022 – Sept. 2025. \$750,000	Jongwan Eun (PI), Seunghee Kim (Co-PI), and Yuris Dzenis (Co-PI)
7	Mass-scale treatment of recycled concrete aggregates (RCA) using carbon dioxide (CO ₂) for its commercial application - Phase II	Nebraska Dept. of Economic Development & Hawkins Const. Company (1:1 Match)	Sept. 2022 – Aug. 2024. \$1,023,062	Seunghee Kim (PI) and Jiong Hu (Co-PI)
6	Assessment of greenhouse gas sequestration resources in Districts 5, 6 and 7 to improve carbon management opportunities in Nebraska	Nebraska Environmental Trust & Nebraska Public Power District	July 2021 – June 2023. \$394,165	Seunghee Kim (PI) and Caroline Burberry (Co-PI)
5	Application of biochar as carbon sequestering and beneficial additive in concrete	Nebraska Center for Energy Sciences Research	Jan. 2021 – Dec. 2022. \$170,000	Jiong Hu (PI), Adam Smith (Co-PI, Nebraska Forest Service), and Seunghee Kim (Co-PI).

4	Multiscale and multiphysical testing-modeling of inorganic microfiber-reinforced engineered barrier materials (IMEBM) for enhancing repository performance	U.S. Department of Energy NEUP	Sept. 2020 – Aug. 2023. \$800,000	Jongwan Eun (PI), Seunghee Kim (Co-PI), Yong-Rak Kim (Co-PI, Texas A&M), Yifeng Wang (Co-PI, Sandia National Lab), and Carlos F. Jove-Colon (Co-PI, SNL)
3	Improvement on the treatment of recycled concrete aggregates (RCA) using CO ₂ for its commercial application	Nebraska Dept. of Economic Development & Hawkins Const. Company (1:1 Match)	Aug. 2020 – Dec. 2021. \$100,000	Seunghee Kim (PI) and Jiong Hu (Co-PI)
2	Pipe-pile-based micro-scale compressed air energy storage for buildings with intermittent renewable energy resources	Nebraska Collaboration Initiative	July 2019 – June 2021. \$147,753	Seunghee Kim (PI), Wei Qiao (Co-PI), and Youngki Jang (Co-PI)
1	Utilization of CO ₂ to improve recycled concrete aggregate (RCA)	Layman Seed Funding	May 2018 – Apr. 2019. \$10,000	Seunghee Kim (PI) and Jiong Hu (Co-PI)

V-2 Fundamental Study: Multi-phase/reactive fluid transport in deformable porous media; Poromechanics; Mineral dissolution/precipitation; Hydro-chemo-thermo-mechanically coupled analysis.

#	Project Title	Sponsor	Period & Award	Investigators
7	RII Track-4: Fundamental study on hydrogen flow in porous media during repetitive drainage-imbibition processes and upscaling for underground energy storage	National Science Foundation	Jan. 2024 – Dec. 2025. \$290,078	Seunghee Kim (PI)
6	Collaborative Research: RII Track-2 FEC: Supporting rural livelihoods in the water-stressed Central High Plains: Microbial innovations for climate-resilient agriculture (MICRA)	National Science Foundation	Aug. 2023 – July 2027. \$2,101,812	Seunghee Kim (PI), Daniel Schachtman (Co-PI), Rajib Saha (Co-PI), Saleh Taghvaeian (Co-PI), and Taro Mieno (Co-PI).
5	Two-phase fluid flow in soft-porous or granular materials under the near absence of gravity	NASA Nebraska EPSCoR Research Infrastructure Development (RID) Program	Nov. 2021 – July 2022. \$10,000	Seunghee Kim (PI)
4	In vitro models of insect wing vein networks for studying insect blood circulation	Nebraska Collaboration Initiative	July 2021 – June 2023. \$40,000	Sangjin Ryu (PI), Seunghee Kim (Co-PI), and Ying Hu (Co-PI).
3	Characterization of hydro-mechanically coupled fluid transport in deformable porous media and application to convection-enhanced drug delivery	Nebraska Collaboration Initiative	July 2020 – June 2022. \$150,000	Seunghee Kim (PI), Sangjin Ryu (Co-PI), and Chi Zhang (Co-PI, at UN-Medical Center).
2	Injection optimization via implementation of mechanically-coupled numerical simulations	Korea Advanced Institute of Science and Technology	July 2019 – Aug. 2019. \$5,005	Seunghee Kim (PI)
1	Development of advanced computational/experimental models to elucidate multiphase fluid transport in	UNL Research Council: Interdisciplinary	Jan. 2017 – Dec. 2017. \$20,000	Seunghee Kim (PI) and Sangjin Ryu (Co-PI)

	disordered-deformable porous media	Research Grants		
-	Experimental study of thermophysical responses of CO ₂ dissolution and CH ₄ outgassing and the reaction rates during multiphase flow	American Chemical Society Petroleum Research Fund	Sept. 2016 – Aug. 2018. \$55,000	Seunghee Kim (PI). Grant awarded but canceled due to the transition to UNL.

V-3 Geotechnics for Resilient Bridge/Transportation Infrastructure: Soil-pile interactions; Geosynthetics-reinforced soils; Resilient bridge abutments and roadways; Real-time sensing and data analysis; Roadside barrier systems.

#	Project Title	Sponsor	Period & Award	Investigators
14	Local characterization of unbound materials (soils/aggregates) for AASHTOWare Pavement ME Design in Nebraska	Nebraska Department of Transportation (NDOT)	July 2023 – May 2025. \$159,036	Jongwan Eun (PI), Seunghee Kim (Co-PI), Jiong Hu (Co-PI), and Jamilia Teixeira (Co-PI)
13	Evaluation of critical shear strength of soils in Nebraska based on revised CPT	NDOT	July 2023 – May 2025. \$158,705	Chung R. Song (PI), Seunghee Kim (Co-PI), and Jongwan Eun (Co-PI)
12	Application of cementitious materials and fiber reinforcement to enhance lime stabilization for Nebraska shale soils	NDOT	July 2022 – May 2024. \$142,129	Jongwan Eun (PI), Seunghee Kim (Co-PI), and Chung R. Song (Co-PI)
11	Application of microfiber reinforcement to weak soils for alternative road stabilization strategy	Mid-America Transportation Center (MATC)	Nov. 2021 – Feb. 2023. \$80,583	Jongwan Eun (PI) and Seunghee Kim (Co-PI)
10	Crash testing of various bridge guardrails, transitions, and other highway safety features - Phase III	Hawaii Department of Transportation	Dec. 2021 – July 2024. \$2,369,485	Ron Faller (PI), Mojdeh Asadollahipajouh (Co-PI), Seunghee Kim (Co-PI), et al.
9	Application of steel sheet-piles for the abutment of water-crossing bridges in Nebraska	NDOT	July 2021 – May 2023. \$154,314	Seunghee Kim (PI), Jongwan Eun (Co-PI), Chung R. Song (Co-PI), and Chungwook Sim (Co-PI)
8	Crashworthy foundations for soil-embedded roadside safety hardware	MATC	Sept. 2020 – Feb. 2022. \$351,788	Joshua S. Steelman (PI), Mojdeh Asadollahipajouh (Co-PI), Seunghee Kim (Co-PI), et al.
7	Assessing performance of geosynthetic reinforced pavement with a large-scale track wheel test and nondestructive testing tools	MATC	Sept. 2020 – Feb. 2022. \$270,000	Jongwan Eun (PI), Seunghee Kim (Co-PI), Chung R. Song (Co-PI), and Jinying Zhu (Co-PI)
6	Development of guideline for the use of geosynthetics in different roadway layered system in Nebraska	NDOT	July 2020 – Mar. 2023. \$106,536	Jongwan Eun (PI) and Seunghee Kim (Co-PI)
5	Evaluation of light pole foundation embedment	Alaska Dept. of Transportation & Public Facilities	June 2020 – Dec. 2022. \$248,261	Joshua Steelman (PI), Mojdeh Asadollahipajouh (Co-PI), Seunghee Kim (Co-PI), et al.
4	REU Site: Sustainability of horizontal civil networks in rural areas	National Science Foundation	Mar. 2020 – Feb. 2023. \$448,597	Shannon Bartelt-Hunt (PI), Christine Wittich (Co-PI), and

				other collaborators (Yusong Li, Richard Wood, Daniel Linzell, Libby Jones, Joshua Steelman, Xu Li, Seunghee Kim, Jongwan Eun)
3	Feasibility study: Alternatives to prevent settlements and bumps at bridge approaches in Nebraska	NDOT	July 2019 – May 2021. \$99,469	Seunghee Kim (PI) and Jongwan Eun (Co-PI)
2	Design optimization and monitoring of joint-less integral and semi-integral abutment bridges in Nebraska	NDOT	July 2018 – Aug. 2021. \$167,687	Chungwook Sim (PI), Seunghee Kim (Co-PI), Jongwan Eun (Co-PI), and Chung R. Song (Co-PI)
1	CPT-based pile design	Nebraska Department of Roads	July 2017 – Dec. 2018. \$105,846	Chung R. Song (PI) and Seunghee Kim (Co-PI)

VI. RESEARCH PROJECTS and CONSULTING EXPERIENCES

At University of Nebraska-Lincoln, Lincoln, Nebraska (Aug. 2016~Present)

- Subsurface hydrogen migration and reactions for geological hydrogen production and engineered storage, Nebraska Center for Energy Sciences Research.
- RII Track-4: NSF: Fundamental study on hydrogen flow in porous media during repetitive drainage-imbibition processes and upscaling for underground energy storage, National Science Foundation.
- Collaborative Research: RII Track-2 FEC: Supporting rural livelihoods in the water-stressed Central High Plains: Microbial innovations for climate-resilient agriculture (MICRA), National Science Foundation.
- Resource assessment for carbon dioxide storage via accelerated carbonation reaction with recycled concrete aggregates (RCA), U.S. Department of Energy.
- Local characterization of unbound materials (soils/aggregates) for AASHTOWare Pavement ME Design in Nebraska, Nebraska Department of Transportation (NDOT).
- Evaluation of critical shear strength of soils in Nebraska based on revised CPT, NDOT.
- Building partnership with Sandia National Laboratories to develop novel engineered barrier materials for geological nuclear waste repository, U.S. Department of Energy.
- Improvement on the treatment of recycled concrete aggregates (RCA) using carbon dioxide (CO₂) for its commercial application - Phase II, Nebraska Department of Economic Development & Hawkins Construction Company.
- Application of cementitious materials and fiber reinforcement to enhance lime stabilization for Nebraska shale soils, NDOT.
- Two-phase fluid flow in soft-porous or granular materials under the near absence of gravity, NASA-EPSCoR.
- Application of microfiber reinforcement to weak soils for alternative road stabilization strategy, Mid-America Transportation Center.
- Crash testing of various bridge guardrails, transitions, and other highway safety features - Phase III, Hawaii Department of Transportation.

- In vitro models of insect wing vein networks for studying insect blood circulation, Nebraska Collaboration Initiative.
- Assessment of greenhouse gas sequestration resources in Districts 5, 6, and 7 to improve carbon management opportunities in Nebraska. Nebraska Environmental Trust & Nebraska Public Power District.
- Application of steel sheet-piles for the abutment of water-crossing bridges in Nebraska, NDOT.
- Application of biochar as carbon sequestering and beneficial additive in concrete, Nebraska Center for Energy Sciences Research.
- Crashworthy foundations for soil-embedded roadside safety hardware, Mid-America Transportation Center.
- Assessing performance of geosynthetic reinforced pavement with a large-scale track wheel test and nondestructive testing tools, Mid-America Transportation Center.
- Multiscale and multiphysical testing-modeling of inorganic microfiber-reinforced engineered barrier materials (IMEBM) for enhancing repository performance, U.S. Department of Energy NEUP.
- Improvement on the treatment of recycled concrete aggregates (RCA) using CO₂ for its commercial application, NE Department of Economic Development & Hawkins Construction Company.
- Characterization of hydro-mechanically coupled fluid transport in deformable porous media and application to convection-enhanced drug delivery, Nebraska Collaboration Initiative.
- Evaluation of light pole foundation embedment, Alaska Dept. of Transportation & Public Facilities.
- REU Site: Sustainability of horizontal civil networks in rural areas, National Science Foundation.
- Development of guideline for the use of geosynthetics in different roadway layered system in Nebraska, NDOT.
- Injection optimization via implementation of mechanically-coupled numerical simulations, Korea Advanced Institute of Science and Technology (KAIST).
- Pipe-pile-based micro-scale compressed air energy storage for buildings with intermittent renewable energy resources, Nebraska Collaboration Initiative.
- Feasibility study: Alternatives to prevent settlements and bumps at bridge approaches in Nebraska, NDOT.
- Design optimization and monitoring of joint-less integral and semi-integral abutment bridges in Nebraska, NDOT.
- CPT-based pile design, Nebraska Department of Roads.
- Utilization of CO₂ to improve recycled concrete aggregate (RCA), Layman Seed Funding.
- Development of advanced computational/experimental models to elucidate multiphase fluid transport in disordered-deformable porous media, UNL Research Council: Interdisciplinary Research Grants.
- Consulting: Heliwalls shoring system (Omaha, NE, USA).

At Bureau of Economic Geology, The University of Texas at Austin, Austin, Texas (Mar. 2013~Aug. 2014)

- Enhanced analytical simulation tool (EASiTool) for CO₂ storage capacity estimation and uncertainty quantification, U.S. Department of Energy.
- The Southeast Regional Carbon Sequestration Partnership (SECARB), U.S. Department of Energy.

At Georgia Tech, Atlanta, Georgia (Aug. 2008~Dec. 2012)

- CO₂ geological storage: Coupled hydro-chemo-thermo-mechanical phenomena – From the pore-scale process to macro-scale implications, U.S. Department of Energy.
- Identification of honeycombs in fresh concrete, Electric Power Research Institute.
- Fly ash characterization, Electric Power Research Institute.
- Rock crushing, Georgia Mining Association.

At KICT, Gyeonggi, Korea (Feb. 2007~June 2008)

- 2007 National Road Cut Slopes Management System (CSMS) Administration Affair, Ministry of Construction and Transportation (MOCT).
- 2006 National Road Cut Slopes Management System (CSMS) Administration Affair, MOCT.
- Evaluation of stability and solution on cut slopes for national road construction between Bupjeon and Socheon, Ssangyong Engineering Construction.
- Stability analysis and solution proposal for cut slopes of Manyang #1 tunnel portal, Hanshin Construction.
- Study on stability analysis and solution proposal for cut slopes of Deokcheon tunnel portal, Keangnam Enterprises.

At Dongho Co. Ltd., Gyeonggi, Korea (Jan. 2005~Jan. 2007)

- Design of a full-scale structure laboratory, Expressway & Transportation Research Institute.
- Design and construction of automated waste collection system in new towns.
 - Incheon Song-do, Seongnam Pan-gyo, Gim-po Janggi, Gwang-myeong Soha New Towns.

At KAIST, Daejeon, Korea (Mar. 2003~Feb. 2005)

- Two-dimensional image processing of soil stiffness profiles using SPT-Uphole and HWAW methods, Korea Institute of Construction & Transportation Technology Evaluation and Planning (KICTEP), MOCT.
- Development of NDT equipment using stress wave propagation, KICTEP, MOCT.
- Smart assessment of ground and earth structures using stress wave propagation, SISTeC (Smart Infra-Structure Technology Center), Korea Science and Engineering Foundation.

VII. ACADEMIC REVIEWS and SERVICES

Journal Reviews

- Applied Energy (1)
- The Geological Society of London (1)
- Geotechnical and Geological Engineering (1)
- Geomechanics and Engineering (1)
- Journal of Building Engineering (1)
- Underground Space (1)
- Computational Geosciences (1)
- Computers and Geosciences (1)
- Journal of Structural Geology (1)
- Géotechnique Letters (2)
- Frontiers (1)
- Engineering Structures (1)

- Geofluids (1)
- Journal of Geotechnical and Geoenvironmental Engineering (2)
- Engineering Geology (1)
- Fuel (1)
- KSCE Journal of Civil Engineering (2)
- Advances in Water Resources (2)
- JGR - Solid Earth (2)
- Greenhouse Gases: Science and Technology (1)
- AGU Water Resources Research (2)
- Geomechanics and Engineering (1)
- AAPG Bulletin (1)
- Earth-Science Reviews (1)
- Marine and Petroleum Geology (1)
- Geomechanics for Energy and the Environment (2)
- International Journal of Greenhouse Gas Control (9)

Book Reviews

- “Science of Carbon Storage in Deep Saline Formations: Process Coupling Across Time and Spatial Scales”, Chapter 16 “Hydrologic, Mechanical, Thermal, and Chemical Process Coupling Triggered by the Injection of CO₂”, 2017.

Conference Proceedings Reviews

- Topic V/Rock Mechanics, Geo-Congress 2023, 2021, 2020, 2019.
- 52nd US Rock Mechanics/Geomechanics Symposium, “Coupled Processes, Fluid-Driven Fracture” and “Numerical Modeling of Civil Rock Engineering Projects”, 2018.
- Geotechnical Frontiers 2017/Sinkhole Detection, Characterization and Engineering, 2016.
- Geo-Chicago 2016 A03/Carbon Sequestration, 2015.
- 13th Annual Carbon Capture, Utilization & Storage Conference, Geomechanics Session, 2014.

Proposal Reviews

- Pre-proposal review: DOE, Office of Nuclear Energy, *FY24 CINR* (Consolidated Innovative Nuclear Research), 2023.
- Proposal review: DOE, Office of Science, The Office of SBIR/STTR Programs (SBIR/STTR), FY 2023 Phase II Release 2, 2023.
- Proposal review: DOE, Office of Clean Energy Demonstrations, *Bipartisan Infrastructure Law: Long-Duration Energy Storage Demonstrations*, 2023.
- Proposal review: DOE, Office of Nuclear Energy, *FY22 CINR*, 2022.
- Proposal review: Breakthrough Energy Fellows program, Cohort 2, *Bill Gates Foundation*, 2022.
- Pre-proposal review: DOE, Office of Nuclear Energy, *FY22 CINR*, 2021.
- Proposal review: Doctoral New Investigator (DNI) program for *ACS Petroleum Research Fund*, 2021.
- Proposal review: Breakthrough Energy Fellows program, Cohort 1, *Bill Gates Foundation*, 2021.
- Proposal review: New Direction (ND) program for *ACS Petroleum Research Fund*, 2021.
- Proposal review: Doctoral New Investigator (DNI) program for *ACS Petroleum Research Fund*, 2015.

Leaderships in International and National Organizations

- A Founding Member of the InterPore Northeast-Midwest (NEMW) US Chapter (2022).
- Organizing Committee “Emerging Opportunities in Geologic Hydrogen Storage and Carbon Sequestration”, June 30, 2022, Santa Fe, NM, USA.
- Organizing Chair of the session “Underground Storage”, Interdisciplinary Track, 56th U.S. Rock Mechanics / Geomechanics Symposium, June 26 - 29, 2022, Santa Fe, NM, USA.

- Organizing Chair of the session “Subsurface Storage and Sequestration”, Interdisciplinary Track, 55th U.S. Rock Mechanics / Geomechanics Symposium, June 20 - 23, 2021, Houston, TX, USA.
- A Founding Member of the Underground Storage and Utilization Technical Committee (USUTC) of ARMA, 2021.
- Organizing Chair of the session “Subsurface Storage and Sequestration”, Interdisciplinary Track, 54th U.S. Rock Mechanics / Geomechanics Symposium, June 28 - July 1, 2020, Golden, CO, USA.
- Chair of the ARMA Future Leaders Selection Committee, 2019-2020.
- Organizing Chair on mini-symposium “Solid-Fluid Interactions in Emerging Energy Geosystems”, 2nd International Conference on Energy Geotechnics (ICEGT), Sept. 2020 (moved to April 2022), La Jolla, CA, USA.
- International Advisory Board for the “2nd International Conference on Energy Geotechnics”, Sept. 20-23, 2020 (moved to April 2022), La Jolla, CA, USA.
- Secretary of the “Rock Mechanics Committee”, Geo-Institute, ASCE, 2019 - 2021.
- Organizing Chair on “Numerical Modeling of Civil Rock Engineering Projects”, 52nd US Rock Mechanics/Geomechanics Symposium, June 2018, Seattle, Washington, USA.
- Chair on “Energy Geotechnics and Sustainability”, The 6th International Young Geotechnical Engineer’s Conference, Sept. 2017, Seoul National University, Seoul, Korea.
- Chair on “Excavation”, The 6th International Young Geotechnical Engineer’s Conference, Sept. 2017, Seoul National University, Seoul, Korea.
- Organizing Chair on “CEA Joint Session: Carbon Capture, Storage, and Utilization”, US-Korea Conference 2017: Engagement Opportunities for Global Challenge, August 9-12, Washington D.C., USA.

Leadership in Regional and Local Organizations

- A member of the planning committee of Geo-Omaha, Omaha, NE, 2017 - Present.

VIII. TEACHING EXPERIENCES

Assistant Professor at University of Nebraska-Lincoln, Lincoln, Nebraska

CIVE 898 Special Topics: Rock and Poromechanics	(Spring 2017, 2021, Fall 2018)
CIVE 898 Special Topics: Numerical Methods on Multiphysics Coupling	(Spring 2018, 2022)
CIVE 436/836 Foundation Engineering	(Fall 2016, 2017, 2020, 2021)
CIVE 434/834 Advanced Soil Mechanics	(Fall 2019)
CIVE 334 Introduction to Geotechnical Engineering	(Spring 2019, 2020, 2023)
MECH 325 Mechanics of Elastic Bodies	(Fall 2022)

Assistant Professor at Western New England University, Springfield, Massachusetts

CEE 412 Petrophysics and Reservoir Geomechanics	(Spring Semester 2016)
CEE 330 Soil Mechanics & CEE 332 Soil Mechanics Lab	(Spring Semester 2016, 2015)
CEE 430 Geotechnical Engineering	(Fall Semester 2015)
CEE 411 Petroleum Fluids & Reservoir Engineering	(Fall Semester 2015)
ME 202 Statics	(Fall Semester 2015, 2014)
CEE 324 Groundwater Engineering	(Spring Semester 2015)
CEE 361 Engineering Fluid Mechanics	(Fall Semester 2014)

Teaching Assistant & Instructor at Georgia Tech, Atlanta, Georgia

Instructor, COE 2001 Statics	(Fall Semester 2012)
Teaching Assistant, CEE 6402 Soil Mechanics	(Fall Semester 2011)
Teaching Assistant, CEE 4405 Introduction to Geotechnical Engineering	(Fall Semester 2009)

Teaching Assistant at KAIST, Daejeon, Korea

Teaching Assistant, Soil Dynamics and Earthquake Engineering	(Spring Semester 2004)
--	------------------------

IX. GRADUATE STUDENTS ADVISED

Post-Doc

- Dr. Dong-Hwa Noh, University of Nebraska-Lincoln, March 2021 – present.
- Dr. Tae-Yeon Kim, University of Nebraska-Lincoln, November 2023 – present.

Ph.D.

- Jingtao Zhang, University of Nebraska-Lincoln (UNL), August 2016 – May 2021. “Energy geo-storage: A large- to medium- and small-scale compressed air energy storage and geomechanical analysis.” (currently: Assistant Professor at Space Engineering University, Beijing, China).
- Tewodros Yosef, UNL, August 2019 – December 2021 (co-advisor: Dr. Ron Faller). “Development of advanced computational methodologies and guidelines for modeling impact dynamics of pile-granular soil systems.” (currently: Post-Doctoral Research Associate at Midwest Roadside Safety Facility, Lincoln, NE).
- Amin Hosseini Zadeh, UNL, August 2017 – May 2022. “CO₂ utilization and subsurface storage: Experimental investigation of CO₂ utilization and storage using recycled concrete aggregates and CO₂ hydrates.” (currently: Geotechnical Designer II at Alfred Benesch & Company, USA).
- Yusuf Alhowaidi, UNL, August 2018 – present (co-advisor: Dr. Jongwan Eun). “(tentative) Field monitoring and long-term analysis of conventional and integral abutment bridge systems.”
- Lateef Lawal, UNL, January 2022 – present. “(tentative) Subsurface storage and utilization of carbon dioxide and hydrogen.”
- Hossein Sousanabadi Farahani, UNL, August 2022 – present. “(tentative) Decarbonization & CO₂ storage for infrastructure materials.”
- Laith Ibdah, UNL, August 2022 – present (co-advisor: Dr. Jongwan Eun).
- Shahriar Mardpour, UNL, June 2023 – present.
- Anup Lamichhane, UNL, August 2023 – present.

Visiting Ph.D.

- Min-Kyung Jeon, University of Nebraska-Lincoln, August 2018 – August 2019 (primary advisor: Dr. Tae-Hyuk Kwon, Korea Advanced Institute of Science and Technology). “Immiscible flow-driven deformation in porous granular media: Pore-scale study.”

M.S.

- Hung Van Phi, University of Nebraska-Lincoln (UNL), January 2021 – December 2022 (co-advisor: Dr. Jongwan Eun). “Experimental and numerical study: Sheet pile abutment systems for water-crossing bridges.” (currently: engineer at H2R Corp., FL, from Jan. 2023).
- Jose Maria Ferdinand V. Calaunan, UNL, January 2021 – December 2022 (co-advisor: Dr. Jongwan Eun). “Evaluation of swelling pressure and shear strength of inorganic microfiber-reinforced bentonite for an engineered barrier system.” (currently: Ph.D. student at Georgia Tech, Atlanta, GA, from Jan. 2023).
- Daniel Robertson, UNL, August 2020 – August 2022 (co-advisor: Dr. Jongwan Eun). “Study on the geosynthetic-reinforced roadway layered systems.” (currently: engineer at HDR, Inc., Omaha, NE).
- Omar Al-Kaseasbeh, UNL, January 2020 – December 2021. “Numerical study: Thermo-mechanical behavior of the pipe-pile-based micro-scale compressed air energy storage (PPMS-CAES).” (currently: Ph.D. student at Georgia Tech, Atlanta, GA).

Undergraduate

- Zubair Husain, University of Nebraska at Omaha (UNO), September 2023 – Present, Research Student. “CO₂ sequestration via mineralization in recycled concrete aggregates.”
- Ollie Edwards, UNO, September 2022 – May 2023, Research Student. “Improvement of non-source controlled recycled concrete aggregates (RCA) via carbonation reaction using CO₂.”
- Russell Masterson, UNO, June 2020 – April 2021, Research Student. “Geotechnical behavior of model test pile for the application of compressed air energy storage.”
- Ryoei Kawabata, June 2019 – August 2019, Summer REU Student. “BioGeotechnology – Novel approach of using bacteria encapsulated in alginate gels to improve soil properties.”
- Ryan Haggerty, June 2019 – August 2019, Summer REU Student. “Advancing implementation of geosynthetically reinforced soil-integrated bridge systems (GRS-IBS) in Nebraska.”

- Kyl Rouse, UNO, January 2019 – May 2019, Research Student. “Improvement of recycled concrete aggregates (RCA) with CO₂ treatment for reuse of construction and demolition (C&D) wastes.”
- Wai-Joon Foong, UNL, August 2018 – May 2019, Research student. “Biogeotechnology – Novel approach of using bacteria encapsulated in alginate gels to improve soil properties.”
- William Preston, Spring 2016, Learning Beyond the Classroom, Civil and Environmental Engineering, Western New England University.

X. PATENTS

- **Kim, S.**, Hu, J., Hawkins, C., Ball, J., Hosseini Zadeh, A., Mamirov, M., and Harper, N., Recycled Concrete Aggregates Carbonation Treatment, U.S. Provisional Patent Application No. 63/304,184, NUtech Ventures, Receipt date: January 28, 2022.
- Barry, K.F., Biagini, M.S.G., Santamarina, J.C., Wall, J.J., Le Pape, Y.M.R., Lindberg, J.T., Cha, M. Dai, S., and **Kim, S.**, Void Detection System, US 2013/0192375 A1, Georgia Institute of Technology.

XI. HONORS AND AWARDS

- 2022-2023 Research Excellence Award, College of Engineering, University of Nebraska-Lincoln, Lincoln, NE, USA, October 2023.
- 2022-2023 Folsom Distinguished Doctoral Dissertation Award, Awardee: Amin Hosseini Zadeh (Advisor: Seunghee Kim), University of Nebraska-Lincoln, 2023.
- UNO Alumni Outstanding Teaching Award for the College of Engineering, University of Nebraska, 2021.
- ARMA (The American Rock Mechanics Association) Future Leaders, 53rd U.S. Rock Mechanics / Geomechanics Symposium, Brooklyn, NY, USA (June, 2019).
- Author Achievement Award, Bureau of Economic Geology, Austin, TX, USA (Apr. 2014).
- Best Paper Award, COMSOL Conference 2013, Boston, MA, USA (Oct. 2013).
- KKCNN Adachi Award (Best research presentation in geotechnical engineering), 17th KKCNN Symposium on Civil Engineering, Ayutthaya, Thailand (Dec. 2004).
- Korean Government Full Scholarships, Korea Advanced Institute of Science and Technology (2003-2004).

XII. PRESENTATIONS and POSTERS

Oral Presentations

17. Fleagle, S., Burberry, C., Kim, S., Lawal, L., and Al Yaaribi, S.S. (2022). "Reservoir characterization for potential CO₂ sequestration in western Nebraska." AGU Fall Meeting, Chicago, IL, December 12-16.
16. Pipe-pile-based micro-scale compressed air energy storage (PPMS-CAES) for a building, 2nd US-Korea Geotech Workshop, University of Nebraska-Lincoln, NE, USA (October 2020).
15. Energy-Geotechnics and pore-scale study on fluid flow in porous media, US-Korea Geotechnical Workshop, Athens, GA, USA (July 2019).
14. Fluid flow in porous media and application to energy-geotechnology, NE Microfluidics Symposium, Creighton University, Omaha, NE, USA (Oct. 2018).
13. Pore-network simulation and experiments for CO₂ geo-storage, NE Fluid Dynamics Research Initiative, Lincoln, NE, USA (Dec. 2017).
12. Microfluidics: Experiments and simulations for energy applications, NE Microfluidics Symposium, Lincoln, NE, USA (Oct. 2017).

11. Pore-network simulations for CO₂ geologic sequestration: Findings and future directions, US-Korea Conference 2017: Engagement Opportunities for Global Challenge, D.C. USA (Aug. 2017).
10. Reactive fluid flow in CO₂ storage reservoirs, KAUST Athenaeum: Dissolution and Precipitation – Implications of Energy Geo-Engineering, Thuwal, Saudi Arabia (Feb. 2016).
9. Hydro-chemo-thermo-mechanically coupled analyses for CO₂ geologic storage, Invited Talk, The Korea University, Seoul, Korea (Jan. 2016).
8. Multi-physics and multi-scale analyses for CO₂ geologic storage, Invited Seminar, University of Massachusetts at Amherst, Amherst, MA (Nov. 2014).
7. Geomechanics at Cranfield, 9th SECARB Briefing, Atlanta, GA (Mar. 2014).
6. Pore pressure/stress coupling during fluid injection and its implications on CO₂ geologic storage, UTCCS-2, Austin, TX (Jan. 2014).
5. CO₂ geologic storage: Multi-physics and multi-scale analyses, at KAIST, KICT and KIGAM, Korea (Dec. 2013).
4. Geomechanical analysis for DAS - Cranfield CO₂ injection site, GCCC Meeting, Houston, TX (July 2013).
3. New results – Geomechanical analysis for DAS, Cranfield, Joint SECARB Meeting, Austin, TX (June 2013).
2. Identification of honeycombs in fresh concrete, to EPRI, Atlanta, GA (July 2011).
1. Thermo-mechanical crushing, Sustainability and CO₂ Issues, GT-ENPC Workshop, Atlanta, GA (May 2009).

Poster Presentations

9. Hydro-thermo-mechanical analysis during the injection of cold CO₂ into a geologic formation and the determination of maximum pressure limit, Gordon Research Conference: Carbon Capture, Utilization & Storage, Colby-Sawyer College, NH, USA (June 2017).
8. CO₂ geologic storage: Pore- and core-scale study, Gordon Research Conference: Carbon Capture, Utilization & Storage, Colby-Sawyer College, NH, USA (June 2017).
7. Constant rate or stepwise injection of cold fluid into a geologic formation: A hydro-thermo-mechanical analysis, 2015 AGU Fall Meeting (Dec. 2015).
6. Pore pressure/stress coupling and implications on CO₂ geological storage, BEG Symposium (Sept. 2013).
5. Engineered CO₂ injection for carbon sequestration in saline aquifers, GTRIC, Georgia Tech (Feb. 2012).
4. CO₂ geological storage - reactive fluid transport, 14th Sowers Symposium, Georgia Tech (May 2011).
3. CO₂ geological storage and implications, 13th Sowers Symposium, Georgia Tech (May 2010).
2. CO₂ geological storage and implications, 2010 Methane Hydrate Meeting, DOE (Jan. 2010).
1. Optimal thermo-mechanical crushing, 12th Sowers Symposium, Georgia Tech (May 2009).

XIII. PROFESSIONAL ACTIVITIES

Professional Certification

- PE - Nebraska, USA, 2020
- EIT - Nebraska, USA, 2017
- Registered Engineer, South Korea, 2003

Professional Affiliations

- Sigma Xi, The Scientific Research Society, Associate Member

- American Society of Civil Engineers (ASCE), Former Member
- The American Rock Mechanics Association (ARMA), Member
- Association of Environmental & Engineering Geologists (AEG), Member
- United States Universities Council on Geotechnical Education and Research (USUCGER), Contact Member
- American Geophysical Union (AGU), Member
- The North American Geosynthetics Society (NAGS), Member

Professional Training

- Civil Underground Curriculum Workshop & Outreach Program, Underground Construction Association (UCA), Philadelphia, Pennsylvania, June 19-22, 2022.
- ADSC 2016 Foundation Engineering Faculty Workshop, Chattanooga, Tennessee, June 5-10, 2016.
- Educate the Educators: A Geosynthetics Training Program for University Professors, Austin, Texas, July 28-29, 2015.
- 2015 PDCA Professor's Driven Pile Institute, Logan, Utah, June 22-26, 2015.
- Writing & Designing NSF Proposals Workshop, Boston, Massachusetts, April 9, 2015.

Educational Training

- Learning by Design, University of Nebraska-Lincoln, Omaha, Nebraska, September 2019 – December 2019. Instructor: Tareq Daher.
- 2018 - 2019 Peer Review of Teaching Project, University of Nebraska-Lincoln, Lincoln, Nebraska, August 2018 – May 2019. Product: Kim, Seunghee. "Benchmark Portfolio: CIVE 334 - Introduction to Geotechnical Engineering" (2019). UNL Faculty Portfolios, 131. <https://digitalcommons.unl.edu/prtunl/131>.